Wireless Data Standards and Technology Report
Wireless Emergency Warning Systems Via Cell Broadcast

Foreword: The Public Safety Wireless Network (PSWN) Program is conducting an ongoing assessment of wireless data standards. The scope of this assessment is to identify emerging and current wireless data standards, technologies, and applications for potential public safety use. This particular study concentrates on cell broadcast technology and its applications that can be used by the public safety community. The particular application of cell broadcast that is explored in this article is wireless emergency warning systems.

Introduction

The commercial wireless industry has grown dramatically from its origins. As wireless technology advances, more and more value-added wireless services (e.g., short messaging service [SMS]) become available to users. In addition, as the number of users and demand for ubiquitous wireless access increases, commercial wireless service providers are forced to enhance their network coverage. Today, in most major metropolitan areas, wireless communications has become a way of life, with high user penetration and generally good access available to wireless networks.

In this environment, commercial wireless service providers realize that the wireless marketplace is ready for new services to further enhance the user experience. In addition, these providers realize the power of wireless technology to reach users. As a part of their civil responsibility, some service providers are using their networks and technology to deliver emergency broadcast messages to their subscribers. Cell broadcast has been identified as an effective way to wirelessly deliver emergency broadcast messages to large numbers of users in a localized area. This article presents an overview of cell broadcast technology and its applications within the public safety community.

What is Cell Broadcast?

Generally, messages can be sent to users via an SMS message sent to that user's particular wireless telephone number. However, when information must be sent to large numbers of users at one time, sending an individual SMS message to each user is not efficient. Similarly, if that information is pertinent to only a localized area, sending individual SMS messages to particular users is practically impossible because service providers cannot differentiate if users are in the localized area or not. Cell broadcast is a technology that can be used in situations where the same message needs to be sent to multiple wireless subscribers in a localized area.

Cell broadcast allows the sender to define and distribute a text or binary message to all mobile terminals connected to a particular set of cellular sites, usually in a specific geographically focused area. Where SMS is generally a one-to-one messaging service, cell broadcast is one-to-many messaging service. With cell broadcast, messages are directed to radio cellular sites, rather than to a specific terminal. Cell broadcast is akin to other mass distribution

media such as teletext or Radio Data System.[1] Using cell broadcast, information (messages) can reach a large number of users at the same time.

Cell broadcast is defined within Phase 2 of the GSM[2] standard in GSM 03.49. Cell broadcast is similar to SMS in that messaging is sent via a wireless network's signaling (control) channels, rather than over voice (traffic) channels. Cell broadcast messages may be from 1 to 15 pages in length, with each page holding up to 93 alphanumeric characters.

Definition and control of cell broadcast messages is provided by a cell broadcast entity (CBE), a multi-user front-end. A CBE can be located at the site of a content provider. A cell broadcast center (CBC) is located at the site of the wireless service provider. The CBC is the heart of the cell broadcast system and acts as a server for all CBE clients. The CBC is the administrator of all cell broadcast messages sent to it from the CBEs. The CBC communicates with the GSM network and acts as the intermediary between the CBE and the GSM network, sending messages to the GSM network for distribution.[3]

Once transferred to the GSM network, cell broadcast messages are transmitted to the applicable Base Station Controllers (BSC) for subsequent broadcast. The cell broadcast message destination is described in terms of cell identifiers, which the BSC uses to route the message content to base transceiver station (BTS) cells. The BTSs selected determine the area over which the message is to be broadcast. Messages are broadcast for a defined number of times with a specified broadcast repetition rate; the cell broadcast messages repetition rate is limited to one new cell broadcast message every 2 seconds. Cell broadcast messages can be updated or removed from the BSC and associated BTS cells anytime during the message broadcast period.

Table 1 describes the unique characteristics of cell broadcast that differentiate it from traditional SMS.

Why Isn't Cell Broadcast Available Yet?

Although wireless service providers consider cell broadcast an extremely attractive revenue-generating service, it is not yet widely available. This is especially true in the United States, where GSM networks are not as common, widespread, and generally preferred as wireless access technology like they are in Europe and Asia.

Even in the countries that do use GSM as the primary wireless access technology, cell broadcast is still in its infancy. So, if the technology is available, and the advantages are clear, why is cell broadcast not part of everyday life? Cell broadcast has three principle drawbacks—lack of standards, lack of a business case to provide the service, and lack of service provider control.

In the early implementations of cell broadcast, the interface between CBC and the base station systems was not defined in the GSM standards, resulting in proprietary solutions from each telecommunications equipment manufacturer. This proprietary environment led to increased costs, weakening the cell broadcast business case for CBC vendors. Similarly, the interface between the CBC and the messaging application was not standardized, increasing the difficulty and cost of creating value-added services that use cell broadcast. The main CBC vendors have developed solutions for virtually all base station system

[1] *http://www.mobilecellbroadcast.com/whatis.asp*

[2] *GSM is the Global System for Mobile Communications*

[3] *http://www.cellbroadcastforum.org/whatisCB/frmset_CBapplications.html*

Table 1 - Cell Broadcast Characteristics

- Cell broadcast is a feature that allows for the transmission of messages up to 93 characters in length to all mobiles within a geographical area served by 1 or more radio cellular sites—information can be made relevant to the users within a specific area
- Cell broadcast operates in "background mode," so it is only received when the mobile unit is idle mode
- New cell broadcast messages can be sent every 2 seconds
- Users can choose whether to accept or reject all messages, or be selective (e.g., accept road traffic reports but not weather reports)—information can be targeted at the correct audiences
- Cell broadcast, as its name implies, is a broadcast service that is a very efficient mechanism for distributing information quickly to many users
- Cell broadcast, like SMS, does not require an expensive traffic channel; instead, it uses the radio control channel
- The ability to receive cell broadcast messages is a standard feature available on all GSM telephones; therefore, the potential market for any new information service is the entire subscriber base plus roamers

offerings by the main telecommunications equipment manufacturers.

The second problem—the lack of a viable business case for cell broadcast—has been much more of a challenge to overcome. Service providers are still considering cell broadcast as a revenue-generating value-added service. Currently, however, they are focusing much more attention on building out their infrastructure to capture more user market share and on promoting the use of their existing value-added services.

The third principle drawback of cell broadcast—the lack of service provider control—is a challenge that is still being addressed. Because cell broadcast is, in fact, a broadcast service, service providers cannot control which users can and cannot receive cell broadcast messages. Users can determine whether they want to see cell broadcast messages; however, because the messages are literally broadcast from base stations, service providers cannot control who views the messages. If a user opts to receive all cell broadcast messages, the service provider cannot prevent that user from seeing them. Service providers cannot charge users for the service because there is no way to turn the service off for a single user if they do not wish to pay. This drawback is being addressed by the creation of a subscription service, which is explained later in this article.

Cell Broadcast Handsets

There is a wide range of cell broadcast capable handsets already in the market. Some GSM service providers estimate that 95 percent of the handsets on their networks support cell broadcast.[4] However, while cell broadcast is widely supported on handsets, the user interface for cell broadcast varies considerably between handsets and between manufacturers.

Certain handset manufacturers are regarded as the makers "best-of-breed" handsets for cell broadcast. These best-of-breed handsets have features such as the

[4] *http://www.mobilecellbroadcast.com/forum.asp*

ability to re-read cell broadcast messages and forward cell broadcast messages as an SMS message.

Once again, the lack of standardization is a significant burden. However, because a large installed base of cell broadcast compliant handsets is available today, cell broadcast represents a large potential market opportunity for service providers, handset vendors, and content providers. This will serve to push the development of cell broadcast.

Uses for Cell Broadcast

Wireless service providers have a clear interest in cell broadcast technology, in particular because several potential revenue streams for cell broadcast have emerged:

- Additional Traffic—Cell broadcast could be used to trigger other types of traffic such as premium rate voice calls and SMS messages. Indirect revenue streams could be gained from associated SMS and voice traffic stimulated by cell broadcast messages.
- Advertising—Service providers could charge content and service providers for access to cell broadcast channels.
- Subscription services—By combining cell broadcast with GSM's SIM[5] card, cell broadcast messages could be encrypted. With encrypted transactions, customers could then subscribe to paid services. This encryption might also be useful for public safety applications.

Retail outlets are interested in cell broadcast technology because customers and potential customers could be sent information about attractions such as sales, special offers, and extended opening times. Shopping centers, exhibition halls, airports, and sports stadiums are the types of highly populous, high-volume locations that retail outlets would most likely target for cell broadcast based services.

Cell broadcast is ideal for delivering local or regional information suited to all the cellular telephone users in that area. Examples of this type of service include hazard warnings, cinema programs, local weather, flight or bus delays, tourist information, parking, and traffic information.

Impacts of Cell Broadcast to the Public Safety Community

Cell broadcast is directly applicable in the public safety community. As an emergency warning service, cell broadcast has the potential to disseminate important information such as severe weather advisories, evacuation notices, and traffic warnings, as well as special instructions (e.g., instructions to tune televisions for detailed and up-to-date information).

In addition, because cell broadcast is a localized service, the public safety community can be assured that only the users in the affected area will receive the emergency warning messages. This is extremely important, especially when the communicated information could possibly cause mass panic. In addition, because the message distribution is localized, public safety officials can communicate specific information to specific areas. For example, one area could be sent "severe weather advisory" messages, while outlying, adjacent areas that would not be as immediately affected, could be sent "severe weather watch" messages.

[5] *SIM is the Subscriber Identity Module that identifies the user and defines the user's profile (e.g., telephone number, user preferences) on a mobile telephone.*

Cell broadcast can also be used for managing and communicating with remote but local emergency service teams. Public safety CBEs could send encrypted messages out to all officers or other staff in a certain area to respond to an incident. This is particularly useful for standby workers who only need to be called to duty in certain places when certain events occur (e.g., HAZMAT teams).

As this technology evolves, more public safety uses for cell broadcast technology will undoubtedly be developed. However, because this technology is relatively immature, especially in the United States, only time will tell what applications will be offered.

What to Expect in the Future

In the future, cell broadcast will become a more widespread technology. As cell broadcast starts to become a reality in the United States and as wireless service providers realize the revenue potential of advertising via cell broadcast, it is likely that cell broadcast technology will become an everyday service. At that time, when cell broadcast becomes a widespread, value-added service that wireless customers rely on, cell broadcast will become an extremely useful tool for the public safety community.

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